National Aeronautics and Space Administration

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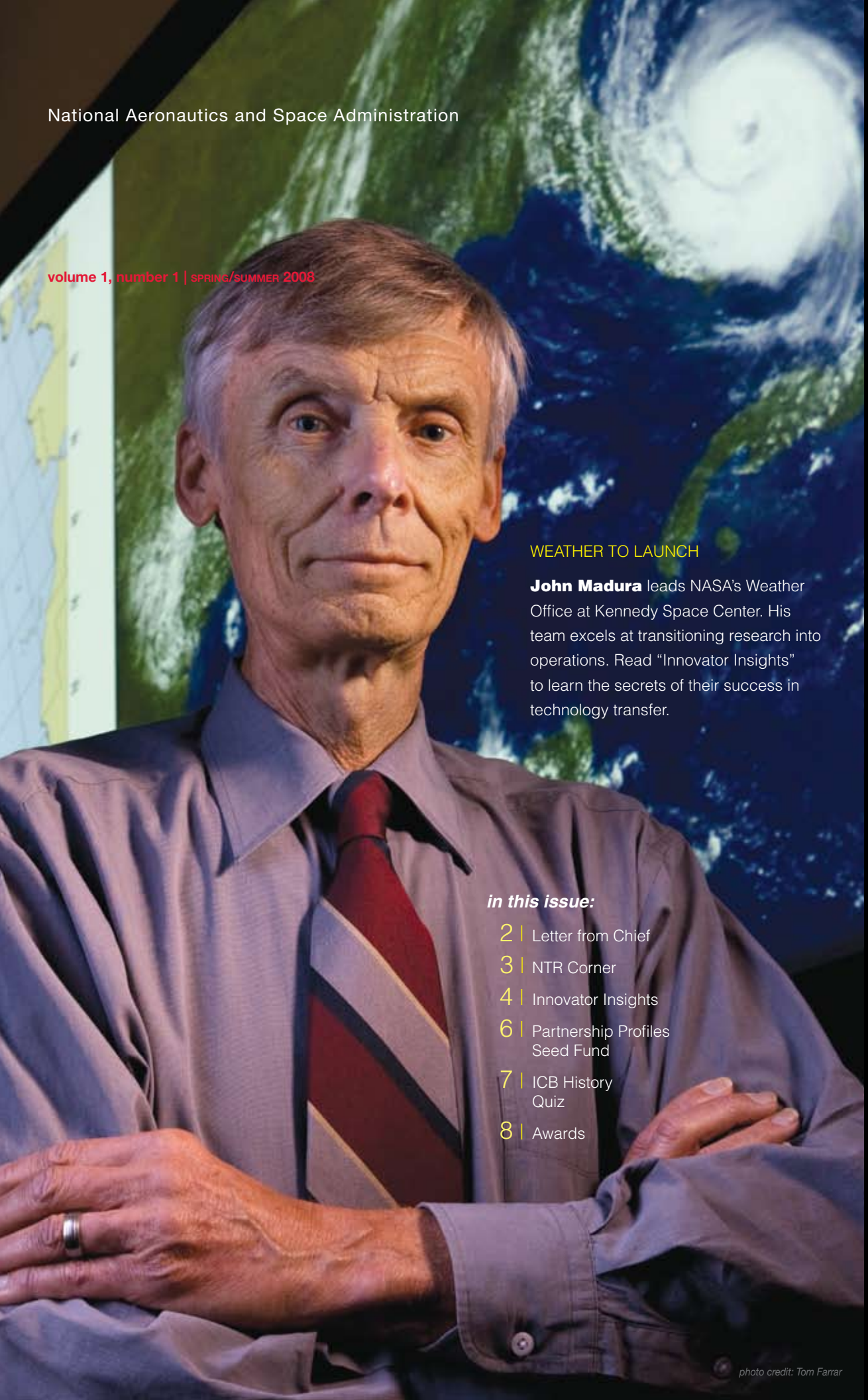
tech transfer

KSC NEWS



WEATHER TO LAUNCH

John Madura leads NASA's Weather Office at Kennedy Space Center. His team excels at transitioning research into operations. Read "Innovator Insights" to learn the secrets of their success in technology transfer.

in this issue:

photo credit: Tom Farrar

Letter from the Chief

Dave Makufka

Forming partnerships that add value to NASA is essential to the success of the space program. These alliances allow NASA to achieve its space exploration, science, and other mission ambitions faster. The Innovative Partnerships Program (IPP) Office promotes and develops those innovative technology partnerships among NASA, U.S. industry, and universities to benefit Agency programs and projects. By combining our resources with those of our partners, we can more efficiently realize our own goals, as well as those of our partners.

We're launching *Kennedy's Tech Transfer News* to keep you informed of the success Kennedy has had in leveraging technology, forming partnerships, obtaining additional funding, and winning awards for technological innovations.

Each person on our staff covers a specialty. Carol Dunn is our marketing manager. Jim Nichols is in charge of licensing. Jan Lomness manages our innovative partnerships manager. Joni Richards and Jennifer Van Pelt handle Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) infusion. Lewis Parrish is in charge of new technology reporting, and Jeff Kohler takes care of technologies.

Our office brokers partnerships with companies and research institutions, and we help secure NASA's intellectual property. We also manage the SBIR and STTR programs for Kennedy that stimulate technological innovation in the private sector, increase the commercial application of those research results, and encourage the participation of socially and economically disadvantaged businesses.

Finally, we'll let you know of awards, conferences and other opportunities to gain recognition for your innovations.

Technology transfer is a vital part of Kennedy Space Center's mission. Your innovations and expertise are national assets that can be used not only to achieve NASA's space program goals, but also to develop new products and processes that benefit industries around the world.

Our door is open. Let's work together for even greater success. ■

Dave Makufka
Chief, Innovative Partnerships Program

NTR Corner: SMART software

technology title:
System Maintenance Automated Repair Tasks

inventors: **Joseph Schuh, Nadean King, Elkin Norena, Brent Mitchell, Louis Locklear, Martin A. Belson, Mary Jo Y. Al-Shihabi**, and **Derek Hardin**

case no.:
KSC-12909

who are these people?!

Photo credit: Regina Mitchell-Ryall

What it is: Originally developed specifically for spacecraft, this interactive decision analysis software system allows for uniform evaluation and repair of discrepancies. SMART captures the thought processes and tacit knowledge involved in decision analysis and provides the data and repair information in a user-friendly automated system.

What makes it better: SMART improves the technical accuracy, safety and timely delivery of repair procedures for a given discrepancy. Unlike existing manual systems, which are time-consuming, difficult to update, and subject to typos, transpositions, and personal preferences, and do not always render consistent outputs, SMART minimizes many types of errors and creates a knowledge base of uniform engineering repair processes.

How it might be used: Flexibly designed, SMART can be used by various engineering groups and work authorization and disposition platforms. The software can easily be tailored to the individual system's needs by the users. SMART has successfully captured the interconnecting hardware corporate knowledge of the Orbiter Electrical Engineering (OEL) group and is the first tool developed that links the hardware specification requirements with the actual "how to" repair methods, sequences, and equipment.

Tech transfer status: Nonprovisional patent application filed; license under negotiation. ■

Register now for the July 14th training session Introduction to NASA Technology Transfer

Monday, July 14 • 9 a.m. to 11:30 a.m. or 1:30 p.m. to 4 p.m.

†This overview course familiarizes civil servants and contractors with NASA policies and procedures for technology transfer, including Kennedy-specific practices. Participants learn how to benefit from Kennedy's Innovative Partnerships Program Office, understand the various mechanisms used to partner with organizations, and identify factors that accelerate the transfer of technology.

Offered in the KLI Building. Choose morning or afternoon session. For details, please call Carol Dunn at (321) 867-6384. To register, visit https://satern.nasa.gov. Registration is on a first-come, first-served basis. ■

KSC Weather Office

The only forecasting the Weather Office does is to predict continued success in transitioning research into operations. John Madura, M.S.; Frank Merceret, Ph.D.; and Jennifer Ward, M.S., share the secrets of their success in technology transition.

What does the Weather Office do?

Let's start with what we don't do: We don't forecast weather; we don't make go/no-go calls at launch countdowns.

At the Weather Office, we help engineers and operators design requirements that make sense, and we make sure those requirements are correctly and effectively communicated to people responsible for meeting them. We have Agency-wide responsibility for operational weather support for launches and landings of NASA manned spacecraft and launches of NASA expendable launch vehicles. We ensure that all engineering studies, design proposals, anomaly analyses, and ground processing and launch commit criteria properly consider atmospheric impacts. We also coordinate all weather research and development funded through Kennedy Space Center, including on- and off-site contractors, universities, and private corporations.

The Weather Office was established in the late 1980s after studies showed that 50 percent of all launch scrubs were due to weather. Our office coordinates all of the weather research and puts it into operations. John Madura manages the office. He is a meteorologist, formerly the Commander of the Air Force's 45th Weather Squadron. Frank Merceret, an atmospheric physicist, came in to lead the Applied Meteorology Unit (AMU) when it was created in 1991. Jennifer Ward joined in 2001 and is becoming our lightning sensor expert. The three of us, along with our civilian contractors, form the Weather Office team.

Storm clouds blanket the sky over the Vehicle Assembly Building and Launch Control Center. Half of all launch scrubs are due to weather, and lightning is a big contributor.

What is the AMU and how does it work?

The AMU develops and evaluates weather technology and then transitions it into operations. The unit is operated by one of our contractors and managed by the KSC Weather Office. The AMU has a reputation for producing high-value products on time and on budget. Before the AMU was created, researchers would develop something and throw it over the fence to the operators, and it might take two Ph.D.s and an engineer to make it work. Because the operators didn't have the time or expertise to make the technology work, the innovations weren't being used. We needed a way to transition technology from the lab to the shop floor and get it working. That's what the AMU does.

How do you measure your success?

Our processes have been showcased in the Navy's database of Best Manufacturing Practices, and our work is frequently published in peer-reviewed journals. We have received awards from NASA and the National Weather Association for sustained excellence in transitioning technology to operations. Most important, what we have developed is being used on the operations floor.

You've been strikingly successful in transitioning innovations to operations. How do you do it?

We have a structure in place to give our customers what they want. NASA, the Air Force, and the National Weather Service (a key player in the Shuttle landing forecasts done by the Spaceflight Meteorology Group in Houston) negotiated a tri-Agency agreement, and all three are involved in managing the AMU. Technology transition is a cooperative effort of all the stakeholders.

The people who will use our products submit proposals on how they would like to employ our resources. Once a year, we meet face-to-face with them to prioritize the proposals and come up with the projects that will do the most people the most good.

What makes your approach work so well?

Two things. First, we are co-located with our customers. The Air Force provides space, utilities and equipment for the AMU next door to the Range Weather Operations forecasters. There can be a cultural gap between scientists and operational forecasters. Sometimes it's as if they speak different languages. Having daily face-to-face access to one another, knowing each other's abilities and limitations, breaks down communication barriers. We know each other personally and professionally. With daily contact, we can make small corrections along the way. Having that human basis to form our relationship is a better way to build our team.

Second, we continuously involve our customers in the planning and execution of our work. This includes quarterly detailed technical reports on the progress of each task, followed by a teleconference to discuss the reports with all the stakeholders.

How does the IPP Office help?

For divisions that don't have the close relationships with their customers that the Weather Office has, the IPP Office can be an intermediary between what the customer needs and what the researchers produce. Building those relationships is a process that can be taught, and the IPP Office is ideal for that.

We use the IPP office to submit information for the Space Act Awards. We want to recognize the people who do good work. IPP also makes sure that information about our products is sent along to NASA Tech Briefs.

The IPP Office has been very helpful in setting up research partnerships. Although most of our technology transition is handled through the AMU, the KSC Weather Office supports a significant amount of research through other organizations, such as universities, other government agencies and the private sector. We see the IPP Office as a facilitator to put us in contact with resources. For instance, IPP connected us to a doctoral student at Florida State University researching lightning cessation. At our Center, people are outside hauling toxins and explosives, moving expensive hardware, operating cranes, lifting payloads, and maintaining facilities. We can't expose that operation to lightning. One of our biggest problems is determining when to shut down operations if lightning is expected and when it is safe to resume work. If we issue false alarms or keep the warnings out too long, it can cost millions of dollars in idled manpower.

Any advice for your colleagues?

Communicate with your customer. Maximize your resources through partnerships. Make use of the IPP Office's help. ■

KENNEDY SPACE CENTER, FLA., August 30, 1983—A powerful electrical storm created an eerie tapestry of light near Space Shuttle Launch Complex 39-A in the hours preceding the launch of STS-8 at 2:32 a.m. that day. The driving rains and dazzling lightning display ceased after this photograph was taken by Sam Walton of United Press International, and the launch proceeded.

IPP Partnership Seed Fund

For the past two years, the IPP at NASA Headquarters has used the Partnership Seed Fund to address barriers and initiate cost-shared, joint-development partnerships. By providing "bridge funding," IPP's Seed Fund enables larger partnership and development efforts and encourages the leveraging of funding, resources and expertise from non-NASA partners, NASA programs and projects, and NASA Centers. Partnership goals include providing for an increased range of technology solutions, a broadened technology portfolio, improved cost avoidance, accelerated development and maturation of technologies, and a larger pool of qualified commercial providers.

Each year, Kennedy's IPP Office coordinates and advises the proposal efforts for projects, including partnerships with other government agencies, small and large businesses, universities, and other NASA Centers. The table below lists projects at Kennedy that received Seed Fund awards on October 31, 2007.

Partner	Technology/Focus	Project Goals/Benefits
DEM Solutions	Electrodynamic and mechanical forces to DEM software	Simulate granular materials, from dust to gravel, to reduce field testing.
Hawaii Office of Aerospace Development and University of Hawaii	Lunar analog field demonstration of exploration technologies	Field test ETDP, ISRU and HRS technologies at a realistic lunar-analog site to reduce mission risk, cost and time.
PPG Industries and University of Texas Health Science Center	Rapid assessment of a smart, environmentally friendly coating	Select and develop materials that release corrosion-inhibitors on demand to prevent corrosion at launch pads.
Sierra Lobo Inc.	Liquid to gaseous helium pump skid	Develop and test a high-pressure liquid helium pump to replace aging helium tube bank trailers.
United Launch Alliance	Deployable sun shield	Create a device to support extended cryogenic storage, saving time and money, as well as to accelerate development of space-based deployable structures.

DEM Solutions Inc.

KSC is working with DEM Solutions to revise the company's existing discrete element modeling (DEM) software with new electrodynamic and mechanical inputs. The resulting software will enable simulation of a range of granular materials, improving engineering design quality. The simulation will be particularly helpful for NASA's dust-mitigation and ISRU exploration programs. The enhanced software tool will reduce the need for extensive field testing and will enhance safety and cost efficiency through early identification of potential problems in lunar surface excavation.

Hawaii Office of Aerospace Development and the University of Hawaii at Hilo

This partnership allows technologies being developed as part of the Exploration Technology Development Program (ETDP) and the In-Situ Resource Utilization (ISRU) and Human-Robotic Systems (HRS) projects to be tested at the lunar-analog site. The Pacific International Space Center for Exploration Systems (PISCES) is developing the site. Simulation testing in relevant environments validates surface system capabilities under realistic mission conditions, reducing mission risk. Equipment "learns" to operate on volcanic soils and process volcanic material at a site that the Apollo astronauts who trained there deemed the most realistic analog training site. Its mineral composition, subsurface permafrost, and high altitude, make it ideal for realistic field testing. Existing testing, infrastructure, and lodging facilities that minimize travel and setup time make it a time- and cost-efficient site.

PPG Industries and the University of Texas Health Science Center (UTHSC)

KSC and PPG are collaborating to create corrosion inhibitors, and UTHSC will conduct short-term laboratory testing and predict long-term field performance of coated substrates. The project aims to protect launch facilities and ground support equipment from the acid generated by solid rocket boosters. The resulting prototype paint system will provide a low-cost, low-maintenance method for preventing corrosion. Such a system will reduce life-cycle costs and improve safety and mission success by preventing catastrophic corrosion-related failures.

Sierra Lobo Inc.

KSC and Sierra Lobo will design, produce, and test a liquid helium pump skid to meet the requirements of the Constellation Heavy Lift (Ares V), which exceed what the traditional compressor system can handle. The pump will increase the efficiency of compressing helium by pressurizing liquid helium and converting it to a cold gas. The liquid helium and high-efficiency pump will allow large, high-pressure, trailer-mounted vessels to be replaced by

ICB History

NASA's Inventions and Contributions Board (ICB) and Space Act Awards Program are practically unknown outside of NASA's scientific community. Yet their history is a microcosm of NASA's own history and extensive technological achievement. The ICB reviews waivers of title to inventions by NASA contractors and gives monetary awards. Created by the Space Act of 1958, the ICB is a visionary, innovative and historical concept that has chronicled NASA's challenges and innovation.

A visionary Congress recognized that if NASA was to achieve it chartered purpose, "the preservation of the role of the United States as a leader in aeronautical and space science and technology," then incentives must be given to the agency's scientists, engineers, and technologists to create technologies needed by the fledgling space program. Today, these contributors are honored with awards for (1) innovations reported in NASA Tech Briefs ($350 per author), (2) software approved for release ($1,000 for a sole author, $500 each for multiple authors), or (3) inventions that have been approved for patent applications ($1,000 for a sole inventor, $500 each for multiple inventors).

Steve Forbes says, "The real source of wealth and capital in this new era is not material things … it is the human mind, the human spirit, the human imagination and our faith in the future." NASA epitomizes this spirit through the imagination of its scientific community. The latest ICB annual report highlights the Robot Cable-Compliant Device that Enduro has developed into a walker called the Secure Ambulation Module used to help injured soldiers at the Walter Reed Medical Center. That

(continued on next page)

Test Your TTQ*

*technology transfer quotient

Software Release and IP Protection

Decide whether the following software-specific statements are true or false.

1. ***Software innovations are considered to be in a different technology category than other inventions; therefore, they don't need to be reported.***

   False. For the purposes of technology reporting, software is considered to be the same as any other Kennedy innovation. In order to protect NASA's intellectual property (IP), the innovation must be reported to the IPP Office using a New Technology Report (NTR).

2. ***I've developed a software application for a specific NASA mission. Since it was developed only for NASA use, I don't need to report the technology.***

   False. All new innovations developed should be reported using an NTR, regardless of the original intended application. Even if your software only has one intended use, the IPP Office can help determine if the innovation has other potential commercial uses and/or strategic value for Kennedy.

3. ***If I report my software via an NTR, I won't be able to control how and by whom my software is used.***

   False. In fact, reporting your software via an NTR is the best way to ensure that its distribution and use are controlled. Plus, filing the NTR makes your innovation eligible for many NASA and non-NASA awards. For more information, go to the IPP Office's awards program.

4. ***I have some contacts outside of NASA who will want to test out my software right away, so I can begin the software release process with them to help speed things along.***

   False. You should never release a software invention to anyone before you have reported it via an NTR. Doing so may result in an inability to secure IP protection. Once reported, your software will be handled by IPP Office personnel, who can determine the best software release process and evaluate commercial and strategic potential.

5. ***I'm not sure if anyone outside of NASA would be interested in my software, so it's a good idea to talk to some industry contacts about the software before I decide whether to report it.***

   False. You should report any new invention—including software—as soon as you recognize that you have a new innovation. It is important to report the software before you speak with anyone outside NASA about it so that the IPP Office can secure appropriate protection for the innovation and control information distributed about it.

6. ***Reporting my software won't protect my invention, since civil servants cannot own a copyright on software.***

   False. While civil servants cannot own copyrights on software, software applications developed by civil servants may be patentable. Therefore, you should report your software innovations so that the IPP Office can help determine if patenting is possible and appropriate. Reporting your software in an NTR also protects it from Freedom of Information Act requirements.

awards

Tech Transfer Awards

October 1, 2007, to March 31, 2008

†Software

Board Actions: 10

Clamshell Sleeving Cutter by James Hart†

Smart Sensor Architecture in Support of Intelligent System Health Management by Carlos Mata†, Angel Lucena†, Rebecca Oostdyk†, Jose Perotti†

Self-Validating Thermocouple by Carlos Mata†, Peter Vokrot†, Jose Perotti†, Carlos Zavala†, Bradley Burns†, and Josephine Santiago†

Monte Carlo Simulation to Estimate the Likelihood of Direct Lightning Strikes by Carlos Mata† and Pedro Medelius†

Electrostatic Precipitator that Operates in Pure GN2 Environments by Charles Buhler†, Carlos Calle†, Mindy Ritz†, Robert Cox†, and Sid Clements†

Volume-Averaged Height Integrated Radar Reflectivity by Monte Bateman†, James Dye†, E. Krider†, Sharon Lewis†, Douglas Mach†, John Madura, Michael McAleenan†, Todd McNamara†, Frank Merceret, Johnny Weems†, John Willett†, Ann Koons†, Dennis Boccippio†, and Hugh Christian†

Automated Metrology Processes by Jeffrey Cheatham†

Electrical Connector Bulkhead Feed-thru Leak Check Device by Brian Elleman†, Kyle Nielsen†, Scott Gillespie†, and Douglas Buford†

Liquid Galvanic Coatings for Protection of Imbedded Metals by Louis MacDowell III (NASA) and Joseph Curran†

External Tank Foam Repair Coring Guide by Antonio Rodriguez†, Caryl McEndree†, and James Hart†

Patent Applications: 3

Communicating System Communicating System with Adaptive Noise Suppression by David Kozel (Purdue University), Richard Birr†, and James Devault (NASA)

Corrosion Prevention of Cold Rolled Steel Using Water Dispersible Lignosulfonic Acid Doped Polyaniline by Tito Viswanathan (University of Arkansas)

Improved Thermal Reactivity of Hydrogen Sensing Pigments in Manufactured Polymer Composites by Luke Roberson, Trent Smith, Martha Williams, LaNetra Tate, and Janine Captain (all NASA???)

Software Released: 8

Change Management Express by George Berry, Joanne Breen, Gail Fischer, Charles Harnden, Patricia Karpinski, and Claudia Mears

Action Management Express by George Berry, Charles Harnden, Patricia Karpinski, and Claudia Mears

LabVIEW Vision Development Module Region of Interest Selection Tool by Christopher Immer†

Microwave Scanning Beam Landing System Near Field Signal Processor by Stephen Simmons† and Marshall Scott Jr.†

Personal Computer Ground Operations Aerospace Language 2 by Brian Bateman†, Jason Kapusta†, Melvin Ayala†, Dana Sorensen†, Michael Popovich†, and James Mikell†

CaTS—A Carrier Tracking System by David Ben-Arieh and Kyle Grabill (both Kansas State University)

Web-based Change Request Management by John O'Brien†

NASA Personal Identity Verification Flash-Based Training Course by Michael Helmick†, Thomas Villane†, Barbara Kaysen†, John Wortman†, Donald DiMarzio†, and Belle Graziano†

Tech Briefs: 7

Hydrogen Peroxide Concentrator by Clyde Parrish (NASA)

Time Domain Reflectometry Using a Time-Varying Pulse Width by Angel Lucena†, Pedro Medelius†, Pamela Mullinex†, Carlos Mata†, PoTien Huang†, Carlos Zavala†, Josephine Santiago†, and John Lane†

Core Technical Capability Laboratory Management System by Linda Shaykhian, Curtis Dugger, and Laurie Griffin (all NASA)

Auto-Generated Semantic Processing Services by Rodney Davis† and Greg Hupf†

Exploration Systems Mission Directorate Distributed Observer Network by Michael Conroy†, Rebecca Mazzone†, William Little†, David Mann†, Priscilla Elfrey†, Kevin Mabiev†, Thomas Cuddy†, Mario Loundermon†, Stephen Spiker†, Don Whiteside†, Frank McArthur†, Tate Srey†, and Dennis Bonilla†

Incremental/Spiral Development Life Cycle Simulation Model for Software Development Projects by Carolyn Mizell†, Charles Curley†, and Umanath Nayak†

Exploration Systems Mission Directorate Distributed Observer Network by William Little (NASA), David Mann†, Priscilla Elfrey (NASA), Kevin Mabie†, Thomas Cuddy†, Mario Loundermon†, Stephen Spiker†, Don Whiteside†, Frank McArthur†, Tate Srey†, and Dennis Bonilla† ■

ICB History

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same device in space in NASA Space Technology 5 Mission, which measures the magnetosphere and demonstrates miniaturized technology for future nanosatellite constellation missions.

Each of NASA's 10 centers has become a part of the history documenting the technological achievements of NASA's past and paving the way for the future. The ICB acts as a repository of NASA's valuable technologies, which continue to have a tremendous impact on the U.S. economy. The 2003 ICB annual report estimated that the extraordinary impact of just a few of these cases on the U.S. economy and world commerce was documented at over $200 billion, and the aggregate of all 98,000 awards granted in the board's 50-year existence is conservatively estimated to have contributed over half a trillion dollars in wealth to the economy with technology that will change how we work and live.

At a recent Space Act Awards Luncheon honoring inventors at the Kennedy Space Center, ICB director Tony Maturo reiterated the importance of the inventors: "You are really the fiber that makes NASA what it is today and what it will be tomorrow." ■

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Kennedy Tech Transfer News is the quarterly magazine of the Innovative Partnerships Program Office at NASA Kennedy Space Flight Center in Cape Canaveral, Florida. This magazine seeks to inform and educate civil servant and contractor personnel at Kennedy about actively participating in achieving NASA's technology transfer goals:

- Filing required New Technology Reports on eNTRe (http://entre.nasa.gov)
- Pursuing partnerships to accelerate R&D
- Finding new applications for space-program technology
- Identifying innovative funding sources
- Communicating partnership opportunities via conferences, workshops, papers, presentations, and other outreach efforts
- Seeking recognition by applying for technology-related awards

Please send suggestions or feedback about *Kennedy Tech Transfer News* to the editor.